

MAR 24 2004

Case VT-2165/DIV

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

OFFICIAL

Applicant: Barker et al.

Serial No.: 10/683,643

Filed: October 9, 2003

For: METHODS OF MAKING LITHIUM
METAL COMPOUNDS USEFUL AS
CATHODE ACTIVE MATERIALS

Examiner: Unknown

Group Art Unit: UNKNOWN

\$ I hereby certify that this
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\$ to:\$
\$ The Commissioner for
\$ Patents
\$ on:

\$

\$

\$ March 19, 2004

\$

\$ Cynthia Kovacevic
\$ Cynthia KovacevicHon. Assistant Commissioner for Patents
Washington, D.C. 20231

Dear Sir:

INFORMATION DISCLOSURE STATEMENT


Pursuant to 37 CFR §§ 1.56, 1.97 and 1.98 applicants wish to make of record the references listed on the attached 1449 forms that may be material to the patentability of the above-identified patent application. An Information Disclosure Statement (based on PTO 1449) listing each of the references is enclosed for the Examiner's convenience.

This Information Disclosure Statement is being filed prior to a first Office Action on the merits therefore no fee is due herewith. However, in the event that a first Office Action on the merits has been issued and a fee is due, the Patent Office is hereby authorized to charge the fee, associated herewith, to Deposit Account No. 220100.

The patents, publications or other information listed on the form 1449 submitted herewith, were previously cited by or submitted to the Patent Office in USSN 09/724,085 filed November 28, 2000 which is being relied upon for priority under 35 USC §120 and therefore copies of such patents or publications are not being submitted herewith.

It is respectfully submitted that the invention claimed in the present application is not anticipated nor made obvious by the teachings of any of the references. It is requested that the references cited herein be considered and cited in the prosecution of the present application.

Respectfully submitted,


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2165/DIV

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|--|------------------------|---------------------------------------|-------------------------------------|
| Form 1449 | Based on Form PTO-1449 | ATTY. DOCKET NO. VT-2165/02 | APPLICATION SERIAL NO. 10/683643 |
| INFORMATION DISCLOSURE STATEMENT BY APPLICANT | | FIRST NAMED INVENTOR Barker et al. | |
| | | FILING DATE October 9, 2003 | ART UNIT Unknown |
| Sheet 1 of 5 | | | |

U.S. PATENT DOCUMENTS

| EXAMINER INITIALS | CITE NO. | DOCUMENT NUMBER | PUBLICATION DATE | NAME OF PATENTEE OR APPLICANT | LOCATION WHERE RELEVANT PASSAGES OR FIGURES APPEAR |
|----------------------|-------------|-----------------|---------------------|-------------------------------|--|
| | AA | US-5,910,382 | 06/08/99 | Goodenough et al. | |
| | AB | US-5,871,866 | 02/16/99 | Barker et al. | |
| | AC | US-5,514,490 | 05/07/96 | Chen et al. | |
| | AD | US-5,296,436 | 03/22/94 | Bortinger | |
| | AE | US-5,262,548 | 11/16/93 | Barone | |
| | AF | US-5,232,794 | 08/03/93 | Krumpelt et al. | |
| | AG | US-4,985,317 | 01/15/91 | Adachi et al. | |
| | AH | US-4,707,422 | 11/17/87 | deNeufville et al. | |
| | AI | US-4,690,877 | 09/01/87 | Gabano et al. | |
| | AJ | US-4,683,181 | 07/28/87 | Armand et al. | |
| | AK | US-4,512,905 | 04/23/85 | Clearfield et al. | |
| | AL | US-4,434,216 | 02/28/84 | Joshi et al. | |
| | AM | US-4,260,668 | 04/07/81 | Lecerf et al. | |

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|----------------------|-------------|-----------------|---------------------|-------------------------------|--|----|
| | CA | EP 1 094 532 A1 | 4/25/2001 | Sony Corporation | | No |
| | CB | WO 00/57505 | 9/25/2000 | Valence Technology, Inc. | | No |
| | CC | WO 01/53198 | 7/26/2001 | Valence Technology, Inc. | | No |
| | CD | WO 01/54212 | 7/26/2001 | Valence Technology, Inc. | | No |

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|-------------------|----------|-----------------|------------------|-------------------------------|--|
| | AN | US-4,049,891 | 09/20/77 | Hong et al. | |
| | AO | US-4,009,092 | 02/22/77 | Taylor | |
| | AP | US-3,736,184 | 05/29/75 | Dcy et al. | |
| | AQ | US-6,085,015 | 07/04/00 | Armand et al. | |
| | AR | US-5,281,496 | 01/25/94 | Clarke | |
| | AS | US-5,683,835 | 11/04/97 | Bruce | |
| | AT | US-5,512,214 | 04/30/96 | Koksang | |
| | AU | US-5,316,877 | 05/31/94 | Thackeray et al. | |
| | AV | US-5,240,794 | 08/31/93 | Thackeray et al. | |
| | AW | US-5,803,947 | 09/08/98 | Engell et al. | |
| | AX | US-5,607,297 | 03/04/97 | Henley et al. | |
| | AY | US-5,384,291 | 01/24/95 | Weimer et al. | |
| | AZ | US-4,177,060 | 12/04/79 | Tylko | |

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|-------------------|----------|-----------------|------------------|-------------------------------|--|-----|
| | CE | EP 0 680 106 A1 | 11/02/95 | | | Yes |
| | CF | JP 61 263069 | | Mizuno | | Yes |
| | CG | WO 98/12761 | 03/26/98 | | | No |
| | CH | WO/01024 | 01/06/00 | | | No |

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| | BA | US- 3,865,745 | 02/11/75 | Block et al. | |
| | BB | US-2,570,232 | 10/09/51 | Hansging | |
| | BC | US-2,508,878 | 05/23/50 | Yates et al. | |
| | BD | US-4,427,652 | 01-1984 | Gaffar | |
| | BE | US-4,460,565 | 07-1984 | Westrate et al. | |
| | BF | US-4,828,833 | 05-1989 | Cordon | |

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| | CI | EP 1 049 182 A2 | 11/02/00 | | | Yes |
| | CJ | JP 2001-11-0414 | 04/20/01 | | | Yes |
| | CK | JP 2001-08-5010 | 03/30/01 | | | Yes |
| | CL | JP 9134725 | 05/20/97 | | | Yes |
| | CM | JP 9134724 | 05/20/97 | | | Yes |
| | CN | JP 62176054 (abstract) | 08/01/87 | | | No |
| | CO | JP 56162477 (abstract) | 12/14/81 | | | No |
| | CP | RU 2038395 (abstract) | 06/27/95 | | | No |
| | CQ | EP 1094533 A1 | 04/25/01 | | | No |

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| Sheet 4 of 5 | | | |

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

| EXAMINER INITIALS | CITE NO. | |
|----------------------|-------------|--|
| | DA | International Search Report for PCT/US97/15544 |
| | DB | Rangan et al., "New Titanium-Vanadium Phosphates of Nasicon and Langbeinite Structures and Differences Between the Two Structures Toward Deintercalation of Alkali Metal," JOURNAL OF SOLID STATE CHEMISTRY, 109 (1994) pp. 116-121 |
| | DC | Delmas et al., "The Nasicon-Type Titanium Phosphates $ATi_2(PO_4)_3$ (A= Li, Na) as Electrode Materials," SOLID STATE IONICS (1988) 28-30 pp.419-423 |
| | DD | Hagemmuller et al., "Intercalation in 3D-Skeleton Structures: Ionic and Electronic Features," MATERIAL RESOURCES SOCIETY SYMPOSIUM PROC., Vol. 210 (1991) pp. 323-334 |
| | DE | Padhi et al., "Lithium Intercalation into NASICON-Type Mixed Phosphates: ... and $Li_2FeTi(PO_4)_3$," 37 th Power Sources Conference, Cherry Hill, New Jersey, Conference Data, June 17-20, 1996, published October 15, 1996 |
| | DF | Sisler et al., "Chemistry A systemic Approach," OXFORD UNIVERSITY PRESS, p.746, 1980 |
| | DG | Gopalakrishnan et al., " $V_2(PO_4)_3$: A Novel NASICON-Type Vanadium Phosphate Synthesized by Oxidative Deintercalation of Sodium from $Na_3V_2(PO_4)_3$," CHEMISTRY OF MATERIALS, Vol. 4, No. 4, July/August 1992, pp. 745-747 |
| | DH | Delmas et al., "The Chemical Short Circuit Method, An Improvement in the Intercalation-Deintercalation Techniques," MATERIALS RESEARCH BULLETIN, Vol. 23, 1988, pp. 65-72 |
| | DI | Ivanov-Schitz et al., "Electrical And Interfacial Properties of a $Li_3Fe_2(PO_4)_3$ Single Crystal With Silver Electrodes," SOLID STATE IONICS, 91, (1996), pp. 93-99 |
| | DJ | Cretin et al., "Study Of $Li_{1-x}Al_xTi_{2-x}(PO_4)_3$ for Li+ Potentiometric Sensors," JOURNAL OF THE EUROPEAN CERAMIC SOCIETY, 15, (1995) pp. 1149-1156 |
| | DK | Patent Abstracts of Japan (1994) Vol. 18, No. 64, (Abstract for JP 06251764) |
| | DL | Okada et al., Center for Materials Science & Engineering, University of Texas, Austin, Texas, " $Fe_2(SO_4)_3$ as a Cathode Material for Rechargeable Lithium Batteries." |
| | DM | Adachi et al., "Lithium Ion Conductive Solid Electrolyte," Chemical Abstracts 112 129692 (1981) |
| | DN | Delmas et al., "A Nasicon-Type Phase as Intercalation Electrode: Sodium Titanium Phosphate ($NaTi_2(PO_4)_3$)," MATERIAL RESOURCES BULLETIN (1987) |
| | DO | Nanjundaswamy et al., "Synthesis, redox potential Evaluation and Electrochemical Characteristics of NASICON-Related-3D Framework Compounds," SOLID STATE IONICS, 92, (1996) pp.1-10 |
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| EXAMINER INITIALS | CITE NO. | |
|---|-------------|---|
| | DP | Nadiri, "Lithium Intercalation in Lithium Titanium Phosphate ($\text{LiTi}_2(\text{PO}_4)_3$)," C.R. Acad. Sci. Ser. 2 (1987), 304(9), pp 415-418 |
| | DQ | Cotton et al., "Advanced Inorganic Chemistry," 3 rd Edition, INTERSCIENCE PUBLISHERS, pp. 864-868 |
| | DR | Linden, "Handbook of Batteries," 2 nd Edition, MCGRAW-HILL, INC. pp36.4-36.9 |
| | DS | Bykov et al., Superionic Conductors $\text{Li}_3\text{M}_2(\text{PO}_4)_3$ (M= Fe, Sc, Cr): Synthesis, Structure and Electrophysical Properties," SOLID STATE IONICS, Vol.38 (1990) pp. 31-52 |
| | DT | Gummow, et al., "Lithium Extraction from Orthorhombic Lithium Manganese Oxide and the Phase Transformation to Spinel," MATERIALS RESEARCH BULLETIN (1993), 28(12), 1249-56 |
| | DU | Gummow, et al., "An Investigation of Spinel-Related and Orthorhombic LiMnO_2 Cathodes for Rechargeable Lithium Batteries," J. ELECTROCHEM. SOC. (1994), 141(5), 1178-82 |
| | DV | Otsuka, et al., "Hydrogen Production from Water by Indium (III) Oxide and Potassium Carbonate Using Graphite, Active Carbon and Biomass as Reductants," CHEM. LETT. (1981), (3), 347-50 |
| | DW | Vasyutinskii, "Appearance of EMF During Ferric Oxide Reduction by Carbon," ZH. PRIKL. KHIM., (1973) 46(4), 779-82 (Abstract) |
| | DX | Gilchrist, Extraction Metallurgy, Pergamon Press (1980, pp. 160-173 |
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